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ABSTRACT

This literature review attempts to ascertain the relationship between educational outcomes and class size in elementary and secondary schools. Material analyzed includes individual research studies available in periodicals, monographs, doctoral dissertations, and research reports. Other reviews, literature analyses, and research related to class size were also consulted. This report analyzes, condenses, and summarizes this extensive mass of literature and addressess itself to those responsible for formulating policy on class size within school districts. (Author/MLF)

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CLASS SIZE AS IT AFFECTS INSTRUCTIONAL PROCEDURES AND EDUCATIONAL OUTCOMES

June, 1970

EA 003 969

■ COLLEGE OF EDUCATION
UNIVERSITY OF MINNESOTA
MINNEAPOLIS, MINNESOTA
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CLASS SIZE AS IT AFFECTS

INSTRUCTIONAL PROCEDURES AND EDUCATIONAL OUTCOMES

by Dwight H. Lindbloom

June, 1970

EDUCATIONAL RESEARCH AND DEVELOPMENT COUNCIL
OF THE TWIN CITIES METROPOLITAN AREA, INC.
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LETTER OF TRANSMITTAL

Dear Council Member:

Varying educational philosophies, spiraling school costs, teacher/school board negotiations, flexible modular scheduling, differentiated staffing together with the use of specialists and paraprofessionals, and a host of other considerations have all brought into sharper focus the question of "what is desirable class size." Further complicating the question has been the lack of comprehensive data relative to the question.

In December of 1969 the staff of the Educational Research and Development Council of the Twin Cities Metropolitan Area, Inc. was requested by its Board of Directors to complete a review of the literature relative to the class size question and to report the results of such a review to the ERDC membership. We are pleased to transmit herewith our findings.

Special appreciation is extended to Dwight H. Lindbloom, ERDC Research Assistant, who was the principal writer and investigator for the project.

Sincerely yours,

Thomas F. Stark

Thomas F. Stark
Executive Secretary

INTRODUCTION

The size of classes at all levels of education has long been an issue, and a perplexing one, to teachers, administrators, and laymen. With rapidly rising enrollments in the elementary and secondary public schools at the turn of the century, various research efforts were begun to determine the effect of class size. Beginning with studies by Rice in 1903, there have been to date over three hundred catalogued studies conducted on the subject (18).

The problem of class size is of extreme importance to the chief administrator in a school district since he is charged with the responsibility of determining school costs for the board of education. The pupil-teacher ratio within his district is one of the most important indices of this cost, since about eighty percent of the current operating budget of public elementary and secondary schools is earmarked for personnel employment. Thus, the total budget of the district is greatly affected by the number of teachers employed to teach a given number of pupils. These costs must be balanced against newer demands for research in curriculum and instruction, educational materials, equipment and technology, compensatory education, new and expanded courses and curriculum, and an increased number of auxiliary and service personnel.

Teachers, administrators, and laymen all desire to "get the most for their money," and at the same time demand quality education. To fulfill the former demand, larger classes are often proposed, while the demand for quality often introduces pressures for smaller classes. Recent increased local resistance to higher taxes has caused many bond issues to be defeated, creating acute problems in the already overcrowded conditions in many of our area schools.

Overcrowding also exists nationally despite greatly expanded budgets for facilities and personnel as reported by Collins in the National Inventory of School Facilities and Personnel. This inventory was conducted by the United States Office of Education under an executive order which emphasized the importance of educational facilities and personnel as vital national resources.

For the past decade the financial squeeze caused by rapidly expanding enrollments and expenditures in public elementary and secondary schools has caused school districts to look to alternate ways of coping with these pressures. In a recent report issued by ERDC, Strategies Employed in Coping with Burgeoning Enrollments, it was reported that while enrollments have risen 35.8 percent within the past ten years, annual expenditures have increased 68 percent and expenditures per pupil 91 percent (42:2).

Larger classes would decrease the trend of rising costs for school personnel and facilities, while reducing class size would substancially increase these related costs. According to a survey of 618,910 elementary classes from school systems where 3,000 or more pupils are enrolled, a regrouping of all children in classes of more than twenty-five into classes of twenty-five, for example, would result in an increase of 118,629 classrooms and an equal number of teachers - an increase of 17 percent (35:16). (In districts with public school enrollments of 100,000 or more, the increase would be greater - 26 percent increase in both classrooms and teachers).

In a special report to Congress, Collins showed a variation in the national need for additional classrooms from about 66,000 to 272,000 depending solely on choice of class size (18:2). If the average cost of a classroom is $50,000, the difference in total cost of facilities depending upon class size preference only would be over ten billion dollars. If a district

of 10,000 students with an average class size of thirty students and a mean salary of $8,000 were to reduce class size to twenty-five students, the additional cost to the district for teacher salaries alone would be over one-half million dollars.

In addition to the costs of additional classroom teachers and classrooms, consideration must be given to additional administrative, custodial, secretarial, and other support personnel so frequently allied with an increase in the number of classroom teachers. In a Baltimore City study on class size (18), it was reported that the number of pupils in 2800 elementary classrooms and in half of all academic classrooms at the secondary level was thirty or more. It was further determined that in order to reduce staff load to fifty professional staff members per one thousand pupils and class size to thirty pupils, the following effects would ensue:

1) 940 new professional staff members would have to be employed;

2) approximately nineteen new elementary schools and six new secondary schools would have to be built;

3) 381 additional support and service workers would have to be employed.

This would require an additional 9.5 million dollars per year for current operating expense and an increased budget for school construction of 86 million dollars (18:2). Additional monies would be required for instructional materials and equipment, the "tools of the trade," as well as for the inservice training of teachers. In addition, costs would accrue to taxpayers for expenses in the preservice preparation of greater numbers of needed teachers. Add to these budgetory problems the problems of teacher shortages on a national level, and it becomes clear that definite economic advantages exist in having larger class sizes (34:6).

The educational advantages in having smaller classes, on the other hand, have long been advocated by school administrators and teachers. Spokesmen for teachers' groups and various educational leaders have raised class size as an issue and have campaigned for smaller classes.

Large classes are still viewed as a major issue to teachers at all levels. In a survey of opinion conducted in the spring of 1968 by the NEA Research Division, over two-thirds (72%) of the public school teachers from throughout the country indicated that large class size was a problem--34.7% classified it as a major problem. The proportion of teachers viewing large class size as a problem is increased to over three-fourths of the teachers teaching in urban classrooms (9:115). The NEA Research Division found that about two-thirds of teachers and principals in elementary schools believe that classes of twenty-four pupils or less allow for more effective teaching than do larger classes (51:107).

The literature abounds with claims of the merits of small classes supposedly contributing to greater educational output and increased pupil learning. Specific advantages used as measures of these outcomes are improved pupil achievement, attitude, attendance and behavior; use of a greater variety of methods and materials in teaching; more individual attention for the student; fewer discipline problems; less physical and mental strain for the teacher; improved teacher morale; improved interpersonal relations in the classroom; an increased teacher knowledge of the pupil; and a decrease in non-teaching duties.

In the past decade the class size question has become increasingly important and complex. Society is looking to educators to cure its ills. As a result, policy is often adopted to provide smaller classes in urban areas and especially in the urban core. Are such decisions justified? Recently

the self-contained classroom concept has been giving way to new staffing and pupil grouping patterns such as team teaching, independent study, flexible modular scheduling and the use of paraprofessionals. Finally, the matter of "class size" has been introduced into the arena of teacher salary negotiations and agreements are being made on the matter of class size. For such decisions to be sound, it is essential to know what effect class size has on educational outcomes.

The Problem of Definition

In reviewing the research on class size it becomes increasingly clear that one of the major problems in the interpretation and application of the data is the kind of variable used to measure class size. Defining this variable is particularly important when dealing with statistics regarding the status and trend in class size in terms of a measure of central tendency. In the past the arithmetic mean has generally been used to report statistics on class size. The "average" measure has been subject to criticism, however, because of its sensitivity to the effect of extreme class size (e.g., physical education, choir, special education), and thus it distorts the picture. For this reason the median class size is often used today.*

The definition of class size is generally felt to be equated with pupil-teacher ratio. This causes confusion because of the operational definition of "teacher." The Research Division of the National Education Association in a survey of class sizes refers to "class" as "the number of pupils for whom a teacher is responsible in a self-contained classroom" (35:7). Ross and McKenna, in devoting an entire section of their report, Class Size: The

* The Staffing Study of the ERD changed from mean to median measures for the 1968-69 school year.

Multi-Million Dollar Question, to the problem of definition, refer to a class as "any group of students scheduled to meet regularly for all or a definite fraction of a school day with one particular teacher for the purpose of learning or being instructed in some particular part of the school's curriculum" (47:3).

Another way of viewing "class size" is to include in the definition of "teacher" other professional people who do not cause a reduction in class size per se, but who do add professionals, thus creating a more favorable "pupil-teacher ratio." It would be very difficult to argue that additional subject-matter specialists, supervisors, administrators, guidance counselors, and other such personnel have no effect on educational output. In fact, Ross and McKenna conclude in their study that "numbers of non-classroom, professional personnel are at least as important in predicting what is going to happen in the classroom as the actual class size" (47:12).

For this reason other measures tend to replace pupil-teacher ratio and mean and median measures of class size. Numerical staff adequacy (NSA) is one such measure derived by McKenna and defined as the number of professionals of all kinds employed per 1,000 pupils (31). The Metropolitan School Study Council, which has produced several studies relating to class size in the past two decades, inclused all professional people in its definition of staff members. However, nearly all other studies have excluded consideration of extra-classroom personnel.

In examining statistics or the results of research studies on class size, then, one must be extremely careful in drawing conclusions, generalizing, or making comparisons, since measures themselves vary widely and the content of the measure is often not precisely controlled. In a recent ERDC survey for

the 1969-70 school year, Staffing Schools in the Twin Cities Metropolitan Area, these dangers are stated:

> It seems prudent to emphasize the danger of making any assumptions about a district's staffing practices on the basis of class sizes alone. There are several variables which may have an effect on the class sizes in any particular school system. For example, class sizes may be affected by the district's utilization of specialists or para-professionals. A high specialist-pupil ratio in a district will not be reflected in class size, but will, at the same time, provide additional professional services for the student. It also seems likely that a school district utilizing large numbers of para-professionals may tend toward larger class sizes.... Great caution should be exercised in comparing school districts. There is little probability that any of the participating school districts have the same staffing objectives. It therefore seems unlikely that any valid decisions with respect to the efficiency of staffing practices in the various districts can be made through comparison. (16:4, 6)

Status and Trends

In a survey in 1969 the National Education Association reported that the average elementary class in the United States consisted of twenty-eight pupils, while for secondary school classes, the average was twenty-six. Generally, as the size of the district increased, so did class size. This data is shown in the table below (9:115-6).

Pupil Enrollment Size	Elementary Class Size	Secondary Class Size
25,000 or more	30	29
3,000 - 24,999	28	26
Below 3,000	26	24

An extensive nationwide survey conducted by the Research Division of NEA in 1965 revealed similar results. The following data was collected representing class size in all of the elementary and kindergarten classes from systems having enrollments of 3,000 or more in their public schools (35:10,14).

Number of pupils per class	Cumulative percent of total	
	Kindergarten pupils	Elementary pupils
More than 45	0.4	0.7
More than 40	1.6	2.5
More than 35	7.4	13.1
More than 30	32.1	48.3
More than 25	68.5	83.9

This data indicates that in 1965 over two-thirds of the kindergarten children in the nation attended classes enrolling twenty-five or more pupils. In the same year nearly eighty-four percent were in elementary classes of the same size. Thus, classes with twenty-five and fewer pupils constituted 31.5 percent of the kindergarten pupils and 16.1 percent of the elementary pupils in the nation.

The table on page nine shows median and mean class sizes by size of school district as well as the estimated percent of elementary school pupils in classes in excess of certain designated sizes (34:10). Comparative data on median class size for individual ERDC districts stratified by student population is available in the ERDC Staffing Study, 1969-70, Part V, pp. 24-34.

Trends in elementary class size can be shown through the use of two variables - the size of district and the year. In the table below these trends in average class size are shown stratified by school size from 1952-53 to 1964-65 (35:12). The first three reported dates are based on school districts grouped by total population, while the last three are based on shcool systems grouped by total enrollments.

ESTIMATED PERCENT OF ELEMENTARY-SCHOOL PUPILS IN CLASSES IN EXCESS OF CERTAIN DESIGNATED SIZES, AND MEDIAN AND MEAN CLASS SIZE, SCHOOL SYSTEMS ENROLLING 3,000 OR MORE PUPILS, BY STRATA, MARCH 1965[a]/

Enrollment stratum[b]/	Total number of school systems	Estimated percent of pupils in classes in excess of					Number of pupils in	
		25 pupils	30 pupils	35 pupils	40 pupils	45 pupils	Median class	Mean class
1	2	3	4	5	6	7	8	9
1--100,000 or more pupils	21	90.4%	65.5%	20.8%	2.5%	0.4%	32	31.6
2--50,000-99,999 pupils	48	88.3	50.9	12.3	1.5	0.2	30	30.1
3--25,000-49,999 pupils	72	85.5	46.7	9.4	0.5	0.1	30	29.5
4--12,000-24,999 pupils	294	82.5	43.7	11.3	3.0	1.2	29	29.2
5--6,000-11,999 pupils	749	78.2	40.9	10.7	2.6	0.8	29	28.6
6--3,000-5,999 pupils	1,547	77.6	40.0	10.8	3.1	0.8	28	28.4
Total--3,000 or more pupils	2,731	82.5%	46.7%	12.6%	2.5%	0.7%	30	29.3
Total number of pupils involved	18,024,163	14,874,698	8,430,392	2,262,755	441,751	123,217		

	Groups by school district size						
Year	100,000 or more	50,000-99,999	25,000-49,999	12,000-24,999	6,000-11,999	3,000-5,999	Total
1952-53	33.8	32.2	29.3	29.1	29.8	29.7	31.9
1955-56	32.9	31.5	29.3	29.3	29.8	29.0	30.4
1957-58	33.2	31.3	29.1	29.0	28.5	28.4	30.1
1959-60	30.0	30.5	28.6	28.2	28.1	27.6	29.5
1961-62	32.3	30.9	30.2	29.2	28.9	28.3	29.6
1964-65	31.6	30.1	29.5	29.2	28.6	28.4	29.3

This data reflects the tendency for class size to decrease with a decrease in district size and over time.

According to the recent staffing study of ERDC schools, the median of the median class size of all districts was as follows: grade one, 25.50; grade two, 26.33; grade three, 27.17; grade four, 27.40; grade five, 27.83; and grade six, 27.58 (16:7).

In a national study of secondary schools in January, 1964, NEA reported an overview of class size in the three hundred seven largest public schools reporting in 1963-64 in terms of a median. The following tables illustrate this for junior and senior high schools (36:10,11).

MEDIAN CLASS SIZE IN JUNIOR HIGH SCHOOLS, 1963-64

Subject	Total	100,000 or more	50,000-99,999	25,000-49,999	12,000-24,999
1	2	3	4	5	6
Art	29.3	32.0	29.9	28.4	27.9
Business	32.8	35.6	33.1	31.2	30.1
English	31.0	33.0	31.4	30.1	29.9
Foreign languages	28.0	32.5	28.7	27.3	26.1
Health and safety education	31.3	33.3	32.7	29.4	30.5
Physical education	36.6	38.7	38.0	35.3	34.8
Home economics	22.4	26.4	23.0	23.0	19.6
Industrial arts	22.9	26.1	24.0	23.2	20.2
Mathematics	31.4	33.6	31.7	30.4	30.2
Music	31.6	32.5	32.3	31.3	30.7
Science	31.5	33.9	31.8	30.7	30.4
Social studies	31.9	34.1	32.2	30.8	30.6
United (core)	31.5	...	31.4	33.8	30.3
Handicapped	16.8	19.4	16.3	12.1	13.6
Other	28.6	31.2	27.2	22.1	27.3
Total	30.6	32.7	31.2	29.9	29.2

MEDIAN CLASS SIZE IN HIGH SCHOOLS, 1963-64

Subject	Total	100,000 or more	50,000-99,999	25,000-49,999	12,000-24,999
1	2	3	4	5	6
Art	26.9	29.0	28.3	26.0	23.3
Business	29.8	30.5	30.7	29.3	28.4
English	29.0	29.4	29.7	29.2	28.1
Foreign languages	26.6	28.6	27.4	26.0	25.0
Health and safety education	32.1	34.1	33.1	31.7	31.3
Physical education	38.8	42.9	37.6	37.8	36.6
Home economics	23.9	26.3	24.3	23.3	22.2
Industrial arts	23.5	26.1	24.1	23.3	21.2
Mathematics	29.6	31.0	29.6	29.0	28.1
Music	34.1	36.3	33.1	34.7	31.8
Science	29.1	31.0	29.5	28.7	27.9
Social studies	31.0	32.2	31.5	31.0	29.8
Driver education	21.1	22.5	18.3	18.1	22.3
Federally supported vocations	20.6	24.2	20.4	22.0	19.1
Other vocations	21.2	27.1	22.5	18.6	18.8
Handicapped	14.2	14.7	15.6	12.4	14.0
Other	30.1	36.5	26.4	29.3	19.0
Total	29.0	30.8	29.6	28.7	27.7

For the school year 1969-70 the ERDC staffing survey reported the following median of the median class sizes reported by member districts in junior and senior high schools by subject area (16:9,10,13,14).

Subject	MEDIAN CLASS SIZE	
	Junior High	Senior High
English	28.50	26.94
Social studies	28.20	27.59
Mathematics	28.00	25.25
Science	27.75	24.00
Foreign language	21.75	18.25
Typing	26.50	31.00
Art	26.75	23.00
Home economics	22.00	19.00
Industrial arts	21.67	19.83
Physical education	31.00	31.17
Speech		21.00
Consumer Ed, O.J.T. or Coop. Ed.		21.25
Office machines		19.50
Shorthand		18.00
Bookkeeping		26.50

In the academic subjects class size medians are generally higher at the junior high school level, and there is a tendency for class size to increase with the size of the district in both junior and senior high schools.

The status and trends presented above are for the sole purpose of giving the reader a general picture of "class size" nationally and locally. The dangers of making specific comparisons and generalizations were stated in the previous section.

Need for the Study

Catalyzed by increased enrollments in the public schools beginning at the turn of the century and the development of reliable instruments in the 20's, a multitude of studies on "class size" were conducted during the first three decades of this century. Yet when these studies are reviewed, one is impressed with the many conflicting conclusions which make the problem more perplexing. It is imperative now and in the near future, when teachers will be negotiating with boards of education regarding policy on class size, to have data available to decision-makers, so that decisions made will reflect both economic considerations and efficiencies of learning. Attention to results of carefully conducted studies is essential regarding this extremely important issue. Research to this end is both important and urgent.

Statement of the Problem

The purpose of this study is to ascertain the relationship between educational outcomes and class size in elementary and secondary schools. The knowledge obtained will provide information to educators so that policy and decision making related to class size will be based on the status of the available research data and not on feeling and emotions. The primary purpose

of this study will be concerned with the following specific objectives related to class size:

1) To distinguish among the various kinds of criteria used to measure educational outcomes related to class size.
2) To analyze the literature on research in class size and educational outcomes in elementary and secondary schools in order to determine if and what conclusive results exist.
3) To identify problems and weaknesses inherent in the research frequently reported, so that wrong conclusions will not be drawn.
4) To suggest further research needed to obtain a more refined picture of the relationship between class size and educational outcomes.

Sources of Data

The writer, in reviewing the literature on class size, analyzed the many individual research studies available (see bibliography) in periodicals, monographs, doctoral dissertations, and research reports. Also analyzed were other reviews and analysis of literature and research related to class size (21, 34, 53). The writer has attempted to analyze, condense and summarize this extensive mass of literature and to synthesize a report meaningful and helpful to those responsible for formulating policy on class size within their districts.

REVIEW OF RESEARCH ON CLASS SIZE

The most comprehensive study of class size research over the first half of this century was made by Howard Blake in 1954 in an unpublished doctoral dissertation (6). He identified two hundred sixty-seven written documents concerning class size. Of those two hundred sixty-seven documents he further identified for analysis those documents where conclusions were based on some type of research effort. Blake considered the following qualifications:

1) Only studies which defined class size as the number of pupils assigned to one teacher for a given period of time were analyzed.

2) Class size per se was the only consideration in his analysis. Teaching load per day and use of extra-classroom personnel were not considered as factors.

3) Only public elementary and secondary school studies were selected.

Eighty-five studies were identified that were based on some type of original research effort. Of the eighty-five research studies so identified, the results reported were as follows:

Smaller classes reported to be advantageous . . .	35 of the studies
Larger classes reported to be advantageous . . .	18 of the studies
No difference detected by author	32 of the studies
	85

Not considering the "no difference" studies, the results showed an almost two to one ratio favoring small classes. However, these eighty-five studies were selected solely on the basis that research procedures were followed, not on the scientific adequacy or acceptability of the procedures.

To determine the adequacy of the research procedures used in the studies, Blake used the following criteria:

a) scientific control

b) adequacy of the sample

c) adequacy of measurement of independent variable (class size)

d) adequacy of the measurement of criterion variables (i.e., pupil achievement, pupil interaction, or pupil participation)

e) rigorousness of examination of the data

f) appropriateness of the conclusions

Based on these six criteria, all but twenty-two of the original two hundred sixty-seven studies were eliminated and classified as unsatisfactory pieces of research. Of the twenty-two studies, sixteen favored small classes, three favored large classes and three were inconclusive.

A breakdown of the twenty-two studies classified by various criteria follows:

Criterion	Small classes superior	Large classes superior	Inconclusive results
Pupil achievement	5	3	3
Teacher and administrator opinion	8	0	0
Teacher knowledge of individual students	1	0	0
Class activities and teacher practices	2	0	0
	16	3	3

The data indicates that on the basis of four criteria, small classes were favored by a five to one ratio over large classes. One should note, however, that the above findings on pupil achievement were far from conclusive.

The criterion variables generally used in studies for the assessment of class size factors prior to 1950 were pupil achievement and promotion. Such studies were generally short term in nature and were usually in the form of

doctoral dissertations. In more recent years there has been a focus on "desirable classroom conditions" and "teaching process," criterion variables which have in many cases replaced "pupil achievement." Vincent (53:142-3) identified five general types of criteria employed to assess class size:

1) cost and related expediencies (generally the chief motivation in conducting the investigation);
2) working conditions, such as teaching load;
3) opinion of teachers and administrators;
4) effect on pupils as measured by achievement;
5) classroom activities, teaching method, and the educational process.

The writer will review research dealing with class size in the following two criteria areas. The areas, operationally defined are:

1. Educational processes - The means of instruction employed to reach desired ends, including teaching methods and procedures and the classroom environment provided - nonachievement variables. Generally the measurement of the characteristic of educational process is accomplished through the use of classroom observation and inventory.
2. Pupil achievement - an end toward which educational processes are directed. Achievement is generally measured through the use of standardized tests, grades, and promotion.

Class Size and the Educational Process

Of the twenty-two studies judged satisfactory by Blake, eleven used criteria other than achievement. All eleven favored small classes. There were no inconclusive results or results favoring large classes (see page 15).

Early studies by Lundberg (27) and Baker (3) showed that smaller classes promote improved attendance, pupil behavior, and teacher morale, as well as an increase of nearly twenty percent in teachers' knowledge of pupils.

In 1943 Newell (38), in the first study of class size and educational adaptability, hypothesized that a relationship exists between class size and invention, early introduction and diffusion of newer teaching methods and educational practices. He found that:

1) teachers of small classes invent more new practices and that there are more new practices introduced by small class teachers than by teachers in large classes (significant at the .05 level);
2) in small classes there is a greater likelihood of early diffusion (inventive practice found in literature but in fewer than twenty-five percent of the school systems in a typical American state) of new practices than in large classes (significant at the .01 level);
3) late diffusion of new practices (twenty-five percent or more diffused) likewise occurs in small classes more than in large classes (significant at the .01 level) (38:38, 39).

Closely related to Newell's study, Richman's study (47), reported by Ross and McKenna, used a checklist of sixty-two desirable classroom practices and teaching techniques and found that where class size had been increased, these new practices were used less frequently. In school systems where class size had been deliberately reduced, he also found that teachers had a greater understanding of the attitudes and needs of individual pupils and a related increase in the use of individualized instruction and materials. Richman discovered that there was as much as a three-year lag in methodological adjustment of teachers accustomed to large classes when assigned smaller classes without notice. If informed of a change to a smaller class size and

asked to plan accordingly, however, results in changed methodology were faster and more pronounced than if no class size policy change had been announced.

In a study of thirty-nine large classes (over thirty) and forty small classes (under twenty-five) in social studies and English, Whitsitt (58) observed classroom instructional methods and concluded that the individual needs of secondary school children may be better met in classes under twenty-five than in classes over thirty-five. There was a higher degree of the following practices in the smaller classes according to Whitsitt: (58:37,38)

1) More work differentiated according to the abilities and interests of each student with teacher help.
2) More group work with meaningful interaction between students.
3) Increased control of activities through student leadership and with no teacher domination.
4) More varied sources of content determined by student planning according to their interests.
5) A less negative character of human relations between all members participating in the classroom.

Focusing attention upon factors of instructional methods, curriculum design, instructional equipment, individual differences, and physical environment, Otto (41) conducted a comprehensive study using a team approach involving four investigators. The study sample was composed of fifty small (twenty-five or fewer pupils) and fifty large (thirty-five or more pupils) elementary classes in grades two, four and six. In the total study nearly five hundred separate items were used to extensively examine the school programs as they existed in the one hundred classes. The investigators concluded that:

> The total educational environment and program for children appear to be somewhat better in small classes than in large classes.... The wisest conclusion which the writers can make is that, in the 50 small and 50 large classes included in this study, the total educational program for children was not discernably different in small classes from that found in large classes. (41:145)

Pugh (44), working with the Associates of the Commission on the 1980 School of the Metropolitan School Study Council at Columbia University, conducted one hundred eighty classroom visitations using a "Guide for Observation" to identify sixteen learning activities (44:7,8) exhibited by pupils in small and large classes. A summary of the results of this extensive investigation follows.

1. A far greater percentage of individual and small group activities are found in small classes than in large classes.

2. A far greater percentage of mass type of instruction is found in large classes than in small classes.

3. Even though there is a high degree of concern for the individual pupil in small classes, a considerable amount of instruction in these classes is mass oriented.

4. Many teachers in both large and small classes depend primarily on four learning activities to develop pupils' concepts--listening, reading, recalling, and observing.

5. The greatest concern for the individual pupil is found at the primary level.

6. In comparing the number of activities in small and large classes, the median occurs in groups of five to nine pupils in small classes. In large classes, however, the median occurs in groups of 10 or more pupils.

7. The chance for arrangements for individualizing instruction in small classes ranges from two in three cases at the primary level to one in two cases at the intermediate and secondary level. In large classes, however, the chance for arrangements for individualizing instruction is only one in three cases.

8. A greater variety of activities takes place within a given period of time in small classes than in large classes.

9. There is a statistically significant difference in favor of small classes in seven of the 16 learning activities. There are: listening, executing manipulative or motor skills, developing or practicing reading skills, outlining, generalizing, analyzing, and creating. There was no significant difference in the other nine activities favoring either small or large classes.

10. From 164 incidents recorded by the observers in the 180 classes, 22 general teaching practices for individualizing instruction emerged. Of the 164 incidents reported, 110 were found in small classes, only 54 in large classes. (44:16)

It seems naive to assume that teaching methods will automatically adjust to group size. Richman and Whitsitt both concluded that reduction in class size by design will promote more individualization of instruction than a like reduction by accident. McKenna and Pugh (32) concluded that while individual differences of pupils can be better served in classes numbering twenty or fewer pupils than in classes of thirty or more, forty-three percent of the instruction taking place in small classes was mass-oriented.

Haberman and Larson (19) in making five hundred seventeen observations in classes of four to fifteen and three hundred eighty-nine observations in classes of twenty-two to thirty-four concluded that:

> ...single activity, with the teacher speaking or monitoring silence was the dominant theme of both large and small classes.... If smaller classes are to make a difference in classroom behaviors of teachers, it may be that they need to be instructed on how to teach a small class in different ways. (19:19)

Coble (10) reported that using a new instrument, Indicators of Quality, one hundred thirty trained observers measured the educational process in 2,181 secondary and 2,106 elementary classrooms. The instrument is composed of fifty-one polarized signs to measure the extent to which elements of individualization, group activity, interpersonal regard, and creativity were judged to be present in the classroom. The tables below show the mean

difference scores for grades three to six and grades ten to twelve (10:2). The mean difference score represents the mean of all net scores (total positive minus total negative signs for each observation) in the classrooms observed. The higher the score, the greater the variables under examination were judged to be present.

ELEMENTARY OBSERVATIONS SCORED BY CLASS SIZE INTERVALS		
Number of students	N	Mean Difference Score
1-5	14	10.00
5-10	34	10.09
11-15	71	10.04
16-20	376	8.72
21-25	999	8.18
26-30	494	6.89
31-35	69	6.60
36-40	10	9.10
41-50	15	4.70
Over 50	14	2.07
Total Observations		2106
Mean Difference Score for Total =		7.99

SECONDARY OBSERVATIONS SCORED BY CLASS SIZE INTERVALS		
Number of students	N	Mean Difference Score
1-5	16	6.23
5-10	162	8.90
11-15	351	7.66
16-20	566	4.51
21-25	553	4.55
26-30	320	4.51
31-35	74	3.99
36-40	37	5.65
41-50	32	6.13
Over 50	64	4.91
Total Observations		2181
Mean Difference Score for Total =		5.41

The data shows that scores decreased with an increase in class size, especially at the elementary level. The dramatic break, however, came at the secondary level in classes with more than fifteen pupils.

Using the same instrument in analyzing eleven internal classroom variables in 18,528 school classrooms, Olson (39) reported similar results relating to size of class. In addition, he examined the style of activities in various subject areas in elementary and secondary classes and concluded that small classes are favorable to large classes.

Reporting a study on creativeness in teaching involving over four hundred elementary teachers and principals, Otte (40) concluded that with increased class enrollment, creativity in teaching diminishes. Among the many factors which foster or hamper creative teaching, class size was especially noted by teachers as important. They agreed with principals that creativity in teaching is fostered by small class enrollment.

Cannon (8), in a class size study in Utah kindergartens, concluded that smaller classes provide better learning conditions for all children. She examined a large class which ranged day-to-day from thirty-four to thirty-nine children and a small class ranging day-to-day from twenty-three to twenty-eight children. To hold the variables as constant as possible, the same teacher was used for both classes, carrying out the same program in the same room with the same equipment. Cannon concluded that the small class situation provided improved relationships and learning climate as well as a higher quality of living and learning. Specifically she found the small class favorable over the large class because of the presence in the small class of:

1) fewer aggressive acts among pupils as evidenced by less pushing, bumping, striking, and crowding;
2) a more relaxed and permissive environment profiding for more fully integrated group relationships;
3) more creativity in teachers' acts of relating to each child as a

unique personality;

4) increased teacher guidance, directiveness, assistance, and ability to listen more to individual children in the small group. Thus, in the small class the teacher became a more significant person in the life of each child;

5) greater satisfaction, more enjoyment and a higher sense of achievement experienced by the teacher.

Obviously the reader must decide for himself whether or not the methodologies or processes analyzed in the reported studies are of consequence to learning. When dealing with methodology, teaching process, educational environment, or "what goes on in the classroom," the results of existing studies are rather conclusive: small classes appear to be superior to large classes in terms of what is generally judged to be desirable methodology or process.

Class Size and Pupil Achievement

While the bulk of the studies which have examined educational processes present in classes of varying size seem to favor small class size over large class size, studies examining the affects of class size on pupil achievement reveal inconclusive results.

In 1937, after reviewing studies relating class size to achievement at all grade levels, Horn (23) concluded that class size was not an important factor in determining achievement as commonly measured. Similar findings were reported by Smith (48) in reviewing research on the effects of class size on achievement in various English courses. She stated, "The more one studies the results of available investigations, the more he marvels at the indifference revealed in the figures where notable variations have been expected." (48:726)

Since Blake's review (6), studies based on pupil achievement as it relates to class size generally seem to have the same mixed findings and produce no conclusive results. Johnson and Lobb (25), in a study designed to investigate various ways of improving instruction and staff utilization, selected classes in English, plane geometry, American history, and biology in eight senior high schools and compared achievement in classes of 10, 20, 35, 60, and 70 pupils. The results of this study showed that there was no significant difference in achievement among the various class sizes.

Using the Iowa Tests of Basic Skills, Spitzer (49) tested pupils in third and sixth grade classes to determine the relationship between class size and achievement. Using four areas of instruction, pupils in small classes (twenty-six and fewer) were compared with pupils in large classes (thirty or more). He concluded that class size, within the range studied, is not a factor in achievement.

Warburton (56), in comparing large and average sized classes in twelfth grade English to determine whether groups of one hundred or more students in a class could achieve as effectively as groups of thirty to thirty-five students, concluded that in composition, reading, and listening, the large group was superior to the small group.

Madden (29) designed a study to measure the achievement of students in general mathematics at the ninth grade level. Excluding the low and high achievers, he found that even though the two groups were not significantly different at the beginning of the semester, there was a significant difference (.05) in ancievement in favor of the students in the large class over those in the small class at the end of the semester.

The conclusion of a study by Anderson, Bedford, Clark, and Schipper (1) in Phoenix Union High School was that there was no statistical evidence that

the students tested learned more or less in algebra depending upon whether they were in the large or small class.

When testing 7,500 seventh and eighth grade pupils in one hundred thirty English classes and one hundred thirty-five mathematics classes with the Iowa Basic Skills battery, Johnson and Scriven (24) concluded that class size had no consistent effect on academic gains even when extreme groups (less than twenty-five and over thirty-three) were compared.

Comparing four hundred eighty-seven first graders in nine classes of fewer than thirty with six classes of more than thirty-six, Frymier (17) controlled the variables of sex, age, and visual and hearing defects. Even though the large classes scored higher initially, the small classes closed the gap and were one month in advance of the large classes on a test in reading achievement during spring testing - a difference significant at the .001 level. There were also fewer retentions among the students of the smaller classes even though their attendance record was lower than those in larger classes. Frymier concluded, "There seems to be clear evidence here that class size influenced achievement in reading for these first grade students." (17:93)

In a study of class size as it relates to achievement in Catholic elementary schools, Menniti (33) compared classes in each diocese of Harrisburg, Pennsylvania, and Evansville, Indiana. Attempting to hold teaching ability constant on the basis of supervisory reports, classes of fewer than thirty-six and forty and over were paired. Students were also paired by ability level. It was concluded that "there was a significant difference in achievement in mathematics in (favor of) large classes for the average pupils of both dioceses. Significant differences in reading achievement of the average pupils were also found in (favor of) large classes in the diocese of Harrisburg." (33:2855)

Nearly all reported studies on class size have been conducted and reported in the United States. However, two studies have been identified which were conducted outside the United States. In England, attempting to determine the effect of class size upon achievement in geometrical drawing, Haskell (20) tested one hundred three first form pupils of a secondary school. Pupil intelligence, pre-test knowledge, instructor differences, classroom and equipment facilities, sex and age were held constant. Measures of pupil achievement as well as attitudes toward the subject showed no differences due to class size except in the third term, and this difference, Haskell concluded, was not sufficient evidence to accept that class size makes a difference in achievement in the subject.

Class sizes of 16-20, 21-25, 26-30, and 31-35 were compared in a national Swedish sample of one hundred fifty sixth grade classes containing 3,691 pupils and another sample in south Stockholm of thirty-nine sixth grade classes containing 1,233 pupils. Using standardized tests in reading, writing, mathematics, English, history, geography, and nature knowledge, Markland (30) concluded that a reduction in class size itself will probably not lead to improved achievement.

Woodson (60) studied overall district policy regarding class size as it related to achievement. He used average class size of the district, class size range, and percentage of classrooms with less than twenty-two pupils (small class) and more than twenty-seven pupils (large class). Woodson found that for arithmetic and reading tests, correlations between residuals (differences between the actual and predicted achievement test scores) computed for each district and percentage of classrooms in the district with more than twenty-seven pupils were consistently negative, while correlations between residuals and percentage of classrooms with less than twenty-two were

consistently positive. He further found, when separating districts by class size into upper and lower thirds, that standard scores of the achievement residuals were higher for those districts in the lower third of class size range.

Nearly all research reported thus far was conducted over a very short period of time. However, recently there have been reported some studies of a longitudinal nature.

Balow (4), in a longitudinal study of reading achievement from grades one to four, reported gains in achievement when class size was reduced from an average of thirty students per class to fifteen. When reading readiness and/or I.Q. were controlled in the analysis of fourth grade reading achievement, students in the small classes for two or more years scored significantly higher than those in larger classes. Balow concluded that the influence of the educational program is cumulative and that the first grade is the critical year in reading instruction. His findings indicate that:

> ...by the middle of the third grade achievement patterns are pretty well stabilized and smaller class size, by itself, does not have sufficient impact to change these patterns. Children in the experimental program (small classes) are still growing at a faster rate (than pupils in large classes) in reading but the rate has slowed from the previous year. (4:186)

Balow also found that reduced class size was beneficial to both children who read with little difficulty and to the poor reader. Only class size was varied in the study. No experimental method of instruction was used nor were special materials provided for the teacher. The increased achievement of the pupils in the small classes thus appears, Balow concluded, to be a function of class size alone.

Similar results were reported by Furno and Collins (18) in an extensive study which attempted to control many of the variables left uncontrolled in

previous research. In a five-year study (1959-64) in the Baltimore City Public Schools with assistance from the Maryland State Department of Education, the hypothesis that pupil achievement is inversely related to class size was tested. The examination of the relationship between class size and pupil achievement in the two critical skills of reading and arithmetic was the primary objective of this study. A related purpose was to determine whether class size in its relationship to achievement is a more critical factor for pupils from ethnically different and less advantaged socio-economic homes than for children from more advantaged homes. This study on the influence of class size was cross classified by intelligence of the pupil and occupation of the father (or the mother if the father was absent). The 16,449 Baltimore pupils in grade three in 1959 were used as the population for this study. The pupils were separated by curriculum - regular or special education - and each group so separated was further sub-divided by race - white or nonwhite.

In an effort to control some of the variables in addition to class size which could affect achievement, the following seven variables were controlled:

1) stabilizing of residence of pupils
2) highest grade obtained by parents of pupils
3) total reading score of pupils
4) total arithmetic test score of pupils
5) percentage of nonwhite faculty
6) Baltimore Teachers Examination score
7) number of years of experience of teachers.

After controlling for the above variables, classes were grouped by size into four categories: 1-25, 25-31; 32-37; and 38 and over. These groupings were not artificially established for the research project, since all results of

the study were obtained without disrupting the pupils or altering the educational setting in any way. In this way the danger of the "Hawthorne or halo effect" was avoided.

The results of this extensive five-year study seem to justify the general importance intuitively placed on class size by teachers, school administrators, laymen, and professional educational organizations regarding pupil achievement in reading and arithemetic. Furno and Collins in their summary of findings of the Baltimore study report as follows:

> Students in the regular curriculum and in smaller classes made significantly greater gains in pupil achievement (on both standardized reading and arithmetic tests) over the five-year period (1959-64) in 188 comparisons to 55 for students in larger classes - a 3.4 to 1 ratio in favor of smaller over larger classes. These results were attained even though in most instances the pupils in larger classes benefited more significantly from such favorable supporting characteristics as parental education, faculty knowledge, and faculty teaching experience. When pupil achievement is analyzed separately for reading and arithmetic, the results were as follows: (1) with respect to reading, the students in the smaller classes made significantly greater gains in reading over the five-year period (1959-64) in 92 comparisons to 26 for students in larger classes - a 3.5 to 1 ratio; and (2) with respect to arithmetic, the students in the smaller classes made significantly greater gains in arithmetic over the five-year period (1959-64) in 96 comparisons to 29 for students in larger classes - a 3.3 to 1 ratio.
>
> The most important finding of this study relates to the smallest class size grouping (1-25 students). Out of 192 comparisons, pupils in the smallest class size grouping made significantly greater gains in pupil achievement than those in larger classes in a ratio of 7.3 to 1. Stated differently, 117 comparisons (61 percent) favored pupils in the smallest class size grouping (1-25), 16 comparisons (8 percent) favored pupils in larger classes, and 59 comparisons (31 percent) showed no significant differences favoring either smaller or larger classes. Also, it should be noted that smaller classes made these significant gains in reading and arithmetic achievement despite the fact that the pupils in smaller classes benefited significantly more from such supporting characteristics as parental education, faculty knowledge, and faculty experience in only 32 percent of the comparisons.
>
> The advantages of the smallest class size (1-25) were considerable more productive for nonwhite students than

for white students. In 96 group comparisons, nonwhite pupils in the smallest classes made significantly greater gains in reading and arithmetic over these in larger classes by a ratio of 21.3 to 1. Stated differently, out of 96 comparisons, nonwhite students in smaller classes made significantly greater gains in achievement in 64 comparisons (66 percent), nonwhite students in larger classes made significantly greater gains in achievement in 3 comparisons (3 percent), and 29 comparisons (30 percent) favored neither nonwhite students in larger nor in smaller classes. Again it should be pointed out that the nonwhite students in smaller classes benefited significantly more from such favorable supporting characteristics as previously enumerated in only 20 percent of the comparisons....

Students in the special education curriculum and in smaller classes made significantly greater gains in pupil achievement (on both standardized reading and arithmetic tests) over the five-year period (1959-64) in 38 comparisons to 3 for students in larger classes - a 12.7 to 1 ratio favoring smaller over larger classes. When pupil achievement is analyzed separately for reading and arithmetic, the results were as follows: (1) with respect to reading, the special education students in smaller classes made significantly greater gains in reading over the five-year period (1959-64) in 18 comparisons to 2 for students in larger classes - a 9 to 1 ratio favoring smaller over larger classes; and (2) with respect to arithmetic, the special education students in smaller classes made significantly greater gains in arithmetic achievement over the five-year period (1959-64) in 20 comparisons to 1 for those special education students in larger classes - a 20 to 1 ratio favoring smaller over larger classes. (18:142-3)

It seems from these results that one might generalize and say that pupils in smaller classes make significantly greater gains in the basic skills of reading and arithmetic than do students in larger classes when other than short term effects are measured. The smallest classes according to the Baltimore study were more productive for non-whites than for white students, but achievement in both regular and special education curricula was greater in smaller classes than in larger classes for both white and nonwhite pupils.

The research design of the Baltimore study was thorough in its control of variables and, as such, its findings merit serious consideration. Dr. Richard McKay, Director of the Division of Research and Development, Maryland

State Department of Education, praised the Baltimore research effort and recognized the uniqueness of this multi-dimensional study particularly in the following areas:

1. The longitudinal research of five years of continuous study when most studies measured the effect of class size from September to December.

2. The number of students in the study.

3. The exploration of 300 items on students, staff, parents, home and school.

4. The differences in learning in varying class groupings between white and nonwhite students.

5. The attempt to measure and hold constant parental employment and intelligence. (18:acknowledgments)

The findings of the several research studies on the effects of class size on pupil achievement as reported in doctoral dissertations during the past decade, together with other short term research efforts on the topic have yielded mixed and inconclusive results. However, as evidenced above, recent more carefully conducted research efforts of a longitudinal nature suggest that in the areas of reading and arithematic, small classes are favorable to large classes.

SUMMARY, CONCLUSIONS, IMPLICATIONS

From the mass of studies conducted and reported to the present time, can anything be said about the relationship of class size to the behavior of students and professional educators? Do teachers adjust their procedures in the classroom when class size is reduced? Does pupil behavior change with this reduction?

Educators are aware of the relationship between pupil and teacher behavior. It seems logical to assume that if pupil behavior is to change (learning process), teacher behavior must also change (teaching process). This learning-teaching relationship is actually one process with interdependencies as shown in this simplified model:

To analyze the teaching-learning process one is confronted with the dilemma of these interdependencies. The teaching component of the process acts upon the learning aspect to cause student behavioral change. This change in turn acts upon the teaching component to cause teacher behavioral changes. Thus, the total process is one of change, adaptation, and development. The process seems to be a seamless web, and to analyze the web by separating the strands which compose it would be to sacrifice realism. The sum of the parts does not equal the whole. An analytic approach is helpful, however, in order to realize the relationship of each part to the whole of the learning process. Thus, in reviewing the literature, the examination of the teaching process in terms of teaching methods and classroom environment measures has been separated from the examination of the learning process in terms of achievement measures.

The evidence advanced in appraising the teaching process and all measures other than pupil achievement overwhelmingly favor small classes to large classes. Among the positive practices taking place more frequently in smaller than in larger classes, the studies report the following:

1) Individualized instruction geared to the needs and interests of students.
2) In addition to the textbooks, wider use of a variety of educational materials to enrich teaching.
3) Increased interaction among pupils and between teacher and pupils.
4) Greater use of innovative or new materials and methods.
5) More student self-control and discipline with less teacher domination.
6) More small group work.
7) Improved human relations among students and with the teacher.
8) A greater number of instructional activities.
9) Fewer discipline problems.
10) Improved morale among teachers.

While research studies dealing with <u>educational processes support policy reducing class size</u>, such a policy based upon <u>past research using pupil achievement as a criterion does not have a clear case to support that policy</u>. Generally speaking, the past studies on the effect of class size on pupil achievement have not been able to control the many variables that affect pupil learning and achievement and thus have resulted in <u>inconclusive and conflicting results</u>.

Vincent (53), in reviewing research on class size, cited three aspects of the class size controversy relating to the lack of control of the variables.

> ...the first dimension of the class-size question is the measure of the variable itself, the control of all personnel

> resources contributing to achievement, or some other criteria being measured. The studies noted generally fail to do this.
>
> The second dimension relates not to the quantity but to the quality of staff. Almost without exception the studies done appear to adopt the mythical view that all teachers are equivalent....
>
> A third dimension concerns materials and equipment - the tools of teaching. No study that has come to the attention of this writer injects any such control into the analysis of the relative effectiveness of large and small classes. (53:141,142)

To these limitations Balke added as major failings of past studies the failure to account for various teaching methods, the short term of studies, atypical situations in which the studies were conducted, and the use of standardized tests as the only measure of pupil achievement. In the small number of studies that met Blake's criteria of satisfactory research (see page 15), this writer found that his "major failings" would apply even to them.

Returning to the teaching-learning model, the writer believes that changes in teaching processes do effect those learning processes which can be measured by the use of achievement criteria. Thus, in order for increased learning to take place, the teaching process must change. If the educational process (what goes on in the classroom) does not change, there is no reason to expect the learning process to change and achievement to increase. Thus, merely reducing class size is no guarantee of increased pupil achievement in the smaller class. What does seem to happen, according to the research studies, is that a reduction in class size causes teachers to adjust accordingly and modify the teaching process to a more individualistic and humanistic approach. Naturally, this will not happen in every case, as was pointed out in the review of studies, but it does occur more often when teachers are advised in advance of a class size reduction and can plan accordingly (Richman). The research supports the hypothesis that small classes are

superior to large classes in producing more desirable teaching practices. Most educators, the writer included, would maintain that the presence of desirable teaching practices will produce greater pupil achievement than if those practices were absent. Why then do the research studies fail to support this belief?

The answer to the above dilemma perhaps lies in the fact that except for a very few longitudinal studies, the past research on class size and achievement set up control and experimental groups (large and small classes) and attempted to measure the change in achievement of the two groups during a very short period of time. Richman's report that there is as much as a three-year lag in the adjustment of teaching behavior established in large classes to a small class situation indicates that the time span of each of the shorter research studies was not long enough for teacher behavior to change - to say nothing of the resultant change in pupil behavior. A reduction in class size can be depicted in the teaching-learning process as an input causing changes in that process as follows:

Smaller classes ⟶ change in teacher behavior ⟶ improved learning (achievement)

This process involves a time factor, and in order to adequately measure the resulting change in pupil achievement from an ititial reduction in class size, educators must allow much more time than has been allowed in the bulk of the research studies. Longitudinal studies by Balow and Furno and Collins seem to support this hypothesis and perhaps provide us with some "light at the end of the tunnel." If their research can be a guide to endeavors in other areas and at other levels, educational decision makers will have more refined tools in the form of hard data with which to formulate policy related to class size. Such efforts will, however, demand a commitment of considerable resources - human, financial, and time.

What implications for class size policy does the research have? What inputs are valuable in class size decision making? Following are some implications gleaned from a review of the literature on class size that might be kept in mind when formulating policy on class size:

1. Most studies on class size reveal inconclusive findings in relation to achievement with the exception of two recent, carefully constructed longitudinal studies (Balow and Furno-Collins).
2. As yet, no set optimum size of class nor best pupil-teacher ratio has been determined. The optimum class size is no doubt dependent upon a host of considerations, not the least of which is the nature of the learning objective sought.
3. A reduction in class size appears to facilitate a positive change in the teaching process.
4. Changes in the teaching process as a result of reduced class size and learning advances appear to be related to the provision for sufficient time allowances for changes to make their effect. The length of time required for changes to be effective in learning advances can apparently be reduced by a designed reduction in class size and related preparation by teachers to adjust their methods to a smaller number of individuals.
5. Teachers prefer small classes and believe that smaller classes increase learning. This is an important consideration since that which is perceived to be real is often real in its consequence. One must also remember that teacher morale contributes much to a successful educational program.
6. The extent to which support personnel exist is extremely important and affects materially judgments on the adequacy of class size.

Numerical staffing adequacy, including consideration of the number of paraprofessionals, is a better indicator of staffing adequacy than is class size per se. Money spent to reduce class size at the expense of reducing the number of supporting services is perhaps a poor investment.

7. Desirable educational outcomes include outcomes other than academic achievement in lower levels of the cognitive domain. Attitudes, values, physical and social skills, psychological and emotional growth, creativity, and appreciation are learning outcomes that also must be considered.

Future Research Needs

It seems evident that there is a relationship between teaching methods and practices and pupil achievement, yet to the writer's knowledge, no study has combined both criteria in the same investigation. The basic question then remains, "class size for what end and under what circumstances?" To answer this question, research on class size must carefully control all other variables which could affect educational ourcomes, including: achievement and grade levels of students studied, subject areas, methodology, characteristics of student and teacher, use of materials and support personnel.

Vincent (54), in summarizing recent research by Woodson and others completed by the Institute of Administrative Research, concludes:

> Both a process measure and achievement test criterion based, like the Woodson measure, on residuals, should be applied to a stratified sample of classes.... Differences between the two levels of size of secondary grades and three levels of size in the elementary grades should be computed using boundaries distinguishing "large" and "small" revealed by this study. Scores expressing a degree of adherence to a class size policy of large or small should then be computed for each district in the sample. These scores, together with the (achievement test) criterion scores, and measures of significant

> inputs - finance, staff characteristics, staff deployment - should be fed into a multivariate program. From this it could be determined how much of the variance in the criteria is accounted for by all the inputs, including class size, and what proportion of it class size uniquely accounts for. This would settle the class size question. (54:3)

It is crucial in educational research to allow for longitudinal studies. In other words, future studies must allow for a greater amount of time before measuring outcomes.

What constitutes "small" and "large" class sizes should be defined and agreed upon by researchers. In the past researchers have used whatever size levels were available for their own investigations. For example, "small" in Balow's study was 15 and "large" was 30, while to Madden "small" was 25-40 and "large" was 70-80. Thus, "small" to Madden was "large" to Balow.

Since much of our curriculum is becoming more individualized, research on class size should measure its effects upon individual student improvement. In the past measures of central tendency have been used.

As educators, we have as goals not only "achievement" as measured by standardized tests, but "critical thinking," "citizenship," "creativity," "attitudes toward learning," "social and emotional development" among a host of other desired outcomes of our educational systems. As yet, research has not been completed nor designed to measure the effects of class size on these desired ends. Cohen (11) emphasized the importance of class size on the stage of learning and growth of the individual student. She identified three student needs (dependencies):

> 1) emotional - social dependency of the learner on the teacher;
> 2) cognitive dependency on the teacher; and
> 3) readiness and ability of the learner to assimulate undiluted verbal presentation of content. (11:17)

Cohen concludes, "Class size must be so determined that each individual can receive from the teacher that share of emotional and cognitive attention

which is a necessary ingredient of his growth as an independent, fully responsible learner who will in time become his own teacher." (11:19)

Traditional staffing patterns are breaking down, and many schools are moving away from the self-contained classroom. Comparisons of learning outcomes in small groups, large groups and independent study situations as well as patterns of team teaching, differentiated staffing, non-gradedness and flexible-modular scheduling should be considered when investigating the effects of the size of learning groups.

Much remains to be completed in class size research, but we have seen much progress and educators do have valid inputs into decision making on class size. According to the research evidence available, small class size makes a difference in changing teaching behavior in a positive direction. If we can now learn to state our objectives in terms of observable student behavior, we will with the additional effort be able to answer the question, "class size for what and under what circumstances?"

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